

In the Claims

1. (currently amended) A link assembly for a robot arm which ~~arm~~ assembly comprises first and second link members each adapted for limited movement one with respect to the other and resilient elastomer means disposed between said first and second members characterized in that the first and second members are configured in a cooperating mating relationship and the elastomer means is disposed between them as a ~~thin~~ layer and the elastomer means is keyed or bonded to both of the first and second link members whereby the layer is sufficiently thin that a bending movement between the members produces shear movement within the elastomer means and ~~reduces any~~ substantially no compressive movement as a result of the relative movement between the said first and said second members.
2. (original) A link assembly as claimed in claim 1 wherein the elastomer is a natural or synthetic rubber.
3. (cancelled)
4. (previously presented) A link assembly as claimed in claim 1 wherein the thickness of the layer is 3 mm or less.
5. (cancelled)
6. (currently amended) A link assembly as claimed in claim ~~5~~ 1 wherein each surface of the elastomeric layer contiguous the member is effectively secured so that in

operation, relative movement between the members produces shear movement within the elastomer, the arrangement being such that the thinness of the layer reduces the tendency towards compression thereby imparting improved stability for the positioning of the components.

7. (previously presented) A link assembly as claimed in claim 1 wherein the elastomer means comprises a plurality of layers of elastomer.

8. (currently amended) A link assembly as claimed in claim 7 wherein an interleaving rigid layer is bonded or keyed to adjacent elastomer layers to separate one layer from its neighbor.

9. (previously presented) A link assembly as claimed in claim 1 wherein the elastomer means is a laminate.

10. (currently amended) A link assembly as claimed in claim ~~7~~ 8 wherein the interleaving ~~or rigid~~ layer between each layer of elastomer is of a material, which is bondable to or capable of being keyed to the elastomer.

11. (previously presented) An assembly as claimed in claim 10 characterized in that the interleaving layer is sufficiently stiff to reduce compression of the elastomer to a minimum during movement of the linked members.

12. (currently amended) An assembly as claimed in claim ~~7~~ 8 wherein the interleaving layer ~~may~~ comprises a ~~thin~~ metal layer, a resin or glass fiber₁, or a mat of

either woven or unwoven material.

13. (currently amended) An assembly as claimed in claim 12 wherein the woven or unwoven material ~~may be~~ comprises carbon fiber or Kevlar.

14. (cancelled)

15. (currently amended) A robotic arm comprising a segment having a plurality of links assemblies as claimed in claim 1 and control means for controlling the movement of said links assemblies within the segment wherein the control means maintains said links assemblies under tension or compression.

16. (currently amended) A robotic arm as claimed in claim 15 wherein the control means ~~may comprises~~ at least one wire extending from one end of the segment to the other.

17. (currently amended) A robotic arm as claimed in claim ~~45~~ 16 wherein the control means ~~may comprises~~ three wires each extending from one end of the segment to the other whereby changing the tension in the wires one relative to the other causes or allows the links to flex thereby controlling movement of the segment.

18. (currently amended) A robotic arm as claimed in claim ~~45~~ 17 wherein the wires are ~~preferably~~ tensioned to maintain the links under compression, the arrangement being such that application of differential tension between the wires causes or allows the segment to move or bend.

19. (currently amended) A robotic arm as claimed in claim 15 wherein, in each link assembly, the first link member comprises an outer disc having holes for control wires so that the control wires extend externally of the other components of the link assembly, and the second link member comprises an inner disc which is adapted to be disposed generally inwardly of the outer disc and which has a central bore to accommodate at least one of control and/or power means for the work head and a rubber disc or layer extending between each inner and outer disc which is bonded or keyed to each, but which is otherwise free-floating between said inner disc and outer disc so that the inner disc is not directly constrained by other components of the assembly.

20. (currently amended) A robotic arm as claimed in claim 15 comprising a plurality of said segments ~~in accordance with the invention as claimed in any one of the preceding claims~~ in which control means is provided for each segment.

21. (original) A robotic arm as claimed in claim 20 wherein each segment terminates in an end cap having wire conduit means for the control wires of other segments of the arm and anchorage means arcuately spaced about the cap for securing the control wires for the segment in question.

22. (previously presented) A robotic arm as claimed in claim 15 wherein at least one of the members of each link is provided with means for guiding the wires from one end of the segment to the other.

23. (previously presented) A robotic arm as claimed in claim 15 wherein each wire is

disposed externally of the segment links and terminates in a ferrule which is adapted to engage with a corresponding recess in the end cap of a segment so that on tensioning the wires, the ferrule is brought into engagement with the end cap to exert a compressive load on each of the links to maintain the stiffness of the links within the segment.

24. (currently amended) A robotic arm as claimed in claim 20 characterized in that each control wire is operated by an actuator and wherein the actuators associated with each control wire are spaced in one or more arcs about ~~the~~ a headboard contiguous one end of the first segment.

25. (previously presented) A robotic arm as claimed in claim 24 wherein the actuator array provides one actuator for each wire to be disposed in a spaced arcuate relationship to define a frustocone, further characterized in that the wire from each actuator is passed about a guide or pulley to provide a fair lead for the control wire from the actuator to the entry into the segment.

26. (currently amended) An assembly ~~or arm~~ as claimed in claim 1 wherein each link is produced as a pair of half links which ~~may be~~ permit assembled back to back assembly, the arrangement being such that an inner link and an outer link halves may be assembled with its associated bonding layer to form unitary link components, a plurality of which together can be assembled to form a segment.

27. (cancelled)

28. (original) An assembly or arm as claimed in claim 27 wherein each of the half links can be located by means of locating dowels provided in mating holes on each of the assembled half-links whereby the assembly can be produced without further connection between the half-linked components and cables can be threaded through the various operating holes in the outer link periphery coupled to the actuator board, the arrangement being such that the actuators can be activated to produce a degree of tension in the board and in the cables whereby the whole assembly is held together so that by varying the tension in the wires, the segment can be manipulated as appropriate.

29. (previously presented) An arm as claimed in claim 15 characterized by an external sleeve provided about each segment.

30. (currently amended) An arm as claimed in claim 15 wherein the sleeve ~~may be~~ is a bellows-type sheath.

31. (currently amended) An arm as claimed in claim 15 wherein ~~the material of the sheath and its~~ comprises a material and a configuration is which are selected to increase the torsional stiffness of the arm ~~with very little increase in bending stiffness.~~

32. (previously presented) An arm as claimed in claim 29 wherein the sheathed segment is filled with a lubricant.

33. (currently amended) An arm as claimed in claim ~~29~~ 32 wherein the lubricant is

either a dry powder or a liquid such as grease and/or oil and wherein the physical characteristics of the lubricant incorporated in the arm are selected according to the environment in which the arm is to operate.

34. (currently amended) An arm as claimed in claim 31 wherein the arm ~~may be~~ is provided with a lubricant reservoir and means for pumping lubricant through the arm and recycled back to the reservoir.

35. (original) An arm as claimed in claim 34 wherein lubricant cooling means are provided for cooling the arm when used in an aggressive environment.

36. (new) A link assembly for a robot arm comprising:

first, second, and third link members having respectively adjacent surfaces formed to fit together in a nesting relationship;

said second link member comprising an elastomeric material disposed between said first and third link members;

said adjacent surfaces of said first, second, and third link members being keyed to one another such that during articulation of the arm the distances between the adjacent surfaces remains substantially constant;

said elastomer material permitting shear deformation of said elastomer material during articulation of the assembly; and

said elastomer material substantially preventing compressive deformation of said elastomer material during articulation of the assembly.